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ABSTRACT

This document, which is designed to provide Iowa literacy service providers and funding agencies with information about the distribution of adult literacy proficiencies over various regions of Iowa, presents and discusses synthetic estimates of adult literacy proficiencies. First, the procedure that was used to develop synthetic literacy estimates for each of Iowa's 17 Public Use Microdata Areas (PUMAs) based on data from the 1990 Census and three literacy scales reported by the National Adult Literacy Survey is explained. Next, the accuracy of previously published statewide synthetic estimates is examined, and the synthetic estimates are compared to recent Iowa State Adult Literacy Survey results. The process of summarizing the synthetic estimates of the prose, document, and quantitative literacies of adults residing in each of Iowa's 17 PUMAs and the steps in calculating general estimates for clusters of PUMAs are outlined. Appended are a map of the geographical boundaries of Iowa's PUMAs and 17 tables reporting the synthetic estimates of the combined, prose, document, and quantitative literacy estimates of adults residing in each PUMA. (MN)

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Synthetic Estimates of Adult Literacy Proficiencies for Regions of Iowa

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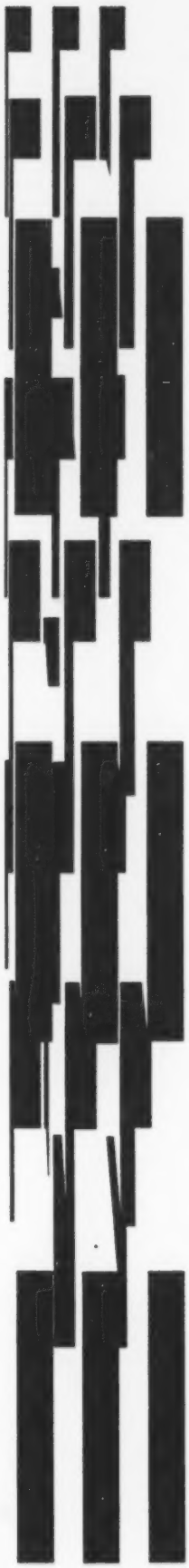

Synthetic Estimates of Iowa's Substate Adult Literacy Proficiencies

Iowa Department of Education

June 1995

State of Iowa

Department of Education

Grimes State Office Building

Des Moines, Iowa 50319

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Synthetic Estimates of Adult Literacy Proficiencies for Regions of Iowa

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Purpose

The purpose of this report is to provide service providers and funding agencies with information about the distribution of adult literacy proficiencies over various regions of the state of Iowa. These estimates can provide information about the relative degree of need for adult literacy services in different regional areas and assist with prioritizing and targeting limited resources for service provision. These estimates are commensurate with those provided on a statewide basis by the recent Iowa State Adult Literacy Survey (Jenkins & Kirsch, 1994), but provide information at the regional level of the state. The estimates are parallel to ones adopted by the National Education Goals Panel as indicators of state progress towards meeting the national goal in adult literacy and lifelong learning (National Education Goals Panel, 1993).

Method

Adult literacy proficiency distributions are estimated for each of the 17 PUMAs (Public Use Microdata Areas) in the state of Iowa in the 1990 Census. Proficiencies are estimated on the 0-500 point scales utilized in the recent National Adult Literacy Survey (NALS). Separate estimates are made for three literacy scales reported by NALS: Prose, document and quantitative literacy, as well as for a combined literacy proficiency scale calculated as the average of the three original scales. Further information about the NALS assessment survey, its results and the interpretation of its scores are described in Kirsch et al (1993).

The estimation methods used are the same as those described in the earlier report, *Synthetic Estimates of NALS Literacy Proficiencies from 1990 Census Microdata* (Reder, 1994). Whereas the earlier report used these methods to predict literacy proficiency at the state level, the current study predicts literacy proficiencies at the PUMA level for the state of Iowa. The predictive model, applied to each 5% sample Census long-form, predicts individuals' (age 16 and above) literacy proficiencies from their background characteristics. These predictions are made with multiple regression models developed from analysis of the relationships between background characteristics and assessed literacy proficiencies among NALS survey participants. The individual background variables used in these predictive equations are those which are common to both the NALS background questionnaire and the 1990 Census long form. Details of the models, the variables involved, and the validity of their predictions are given in the earlier report (Reder, 1994).

The synthetic statewide estimates for Iowa are shown in Table 1 along with the corresponding results from the Iowa State Adult Literacy Survey (the "SALS Estimates" in the table). These summary data indicate that the synthetic estimates are quite accurate for the overall proficiency and for the percentage of the adult population at Level 2. Synthetic estimates for Level 1 are somewhat lower and those for the combined Levels 3-5 are somewhat higher than their counterparts estimated by the survey. The tendency of the model to underestimate the percentage of adults at Level 1 should be kept in mind in working with the estimates for Iowa's PUMAs.

Table 1

Synthetic and SALS Estimates for Iowa

		Synthetic Estimate		SALS Estimate	
Combined	Mean:	284		284	
	Level 1	185,011	(9%)	292,616	(14%)
	Level 2	468,447	(23%)	515,460	(25%)
	Levels 3-5	1,370,851	(68%)	1,287,336	(61%)
Prose	Mean:	286		285	
	Level 1	167,863	(8%)	311,903	(15%)
	Level 2	453,961	(22%)	487,891	(22%)
	Levels 3-5	1,402,485	(69%)	1,295,618	(62%)
Document	Mean:	280		280	
	Level 1	214,334	(11%)	332,772	(16%)
	Level 2	519,266	(26%)	536,009	(26%)
	Levels 3-5	1,290,709	(64%)	1,226,631	(59%)
Quantitative	Mean:	287		287	
	Level 1	176,838	(9%)	299,448	(14%)
	Level 2	427,145	(21%)	443,676	(21%)
	Levels 3-5	1,420,326	(70%)	1,352,288	(65%)
Population		2,024,309		2,095,412	

Notes: Percentages may not sum to 100% due to rounding. SALS estimates based on unofficial corrections for undercount in the 1990 US Census, whereas synthetic estimates are based on official 1990 Census counts.

Results

Results of applying these techniques to Iowa's 17 PUMAs are presented in the figure and tables accompanying this report. The map in Figure 1 displays the geographical boundaries of the PUMAs in Iowa (Census of Population and Housing, 1991). Most PUMAs correspond to clusters of contiguous counties, as shown in the map. The urban area of Des Moines, on the other hand, is subdivided into multiple PUMAs, as shown in the map.

Results are presented for each PUMA in the appended tables. The Population shown in each table is the 1990 Census count of individuals age 16 and older not living in group quarters. Each table provides estimates of each of the literacy proficiencies (prose, document, quantitative, combined): the mean proficiency and the percentages of adults at three proficiency levels (Level 1: under 225; Level 2, 226-275; Levels 3-5, 276 and above). These are standard proficiency reporting levels from the NALS; adults performing at Levels 1 and 2 are generally taken as those most in need of improved literacy. Prose, document and quantitative literacy were defined by NALS as follows:

> *Prose literacy*: "the knowledge and skills needed to understand and use information from texts that include editorials, news stories, poems, and fiction" (Kirsch et al, 1993: 3)
>
> *Document literacy*: " the knowledge and skills required to locate and use information contained in materials that include job applications, payroll forms, transportation schedules, maps, tables, and graphs" (Kirsch et al, 1993: 3)
>
> *Quantitative literacy*: " the knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed materials" Kirsch et al, 1993: 3-4).

Generating Estimates for Clusters of PUMAs

The PUMA-level estimates in the appended tables can readily be aggregated to produce corresponding estimates for clusters of two or more PUMAs. To aggregate data in this way across PUMAs, it is important to use the tabled population sizes as weights. To calculate a mean literacy proficiency for an aggregate of two PUMAs, for example, compute the weighted average of the two PUMAs' corresponding mean proficiencies, using the listed populations as weighting factors. As another example, to calculate the percentage of Level 1 proficiencies for the two-PUMA aggregate, multiply each PUMA's Level 1 percentage by its corresponding population size, giving the number of individuals estimated at Level 1 in the given PUMA. By adding these cross-products together and dividing their sum by the total number in the two-PUMA aggregate (i.e., by the sum of the two population counts), the aggregate percentage at Level 1 in the two PUMAs together can be estimated.

Discussion

Despite the small degree of measurement error present, especially for Level 1 percentages (further discussed by Reder, 1994), the PUMA-level literacy estimates should be quite useful for their

present purpose, contrasting the overall literacy needs of the adult populations in various regions of Iowa. Considerable variation is evident among the overall literacy proficiencies of these regions. If we examine, for example, the percentage of the adult population having a combined literacy proficiency at Level 3 or above (taken by the National Educational Goals Panel as an indicator of the percentage of adults with adequate literacy skills and knowledge), we find a range of 62 - 84 % across the various PUMAs. This corresponds to a varying level of need for improved literacy (Level 1 + Level 2) of 16 - 38% of the adult population across the 17 PUMAs. The lowest level of need (using the Level 1 + Level 2 criterion) occurs in Des Moines (PUMA 800), whereas the highest level occurs in the southern counties (PUMA 1600). The mean combined literacy proficiency ranges from 280 to 303 across Iowa's PUMAs, with the highest value in outlying Polk County (PUMA 800) and the lowest in the southern counties (PUMA 300).

References

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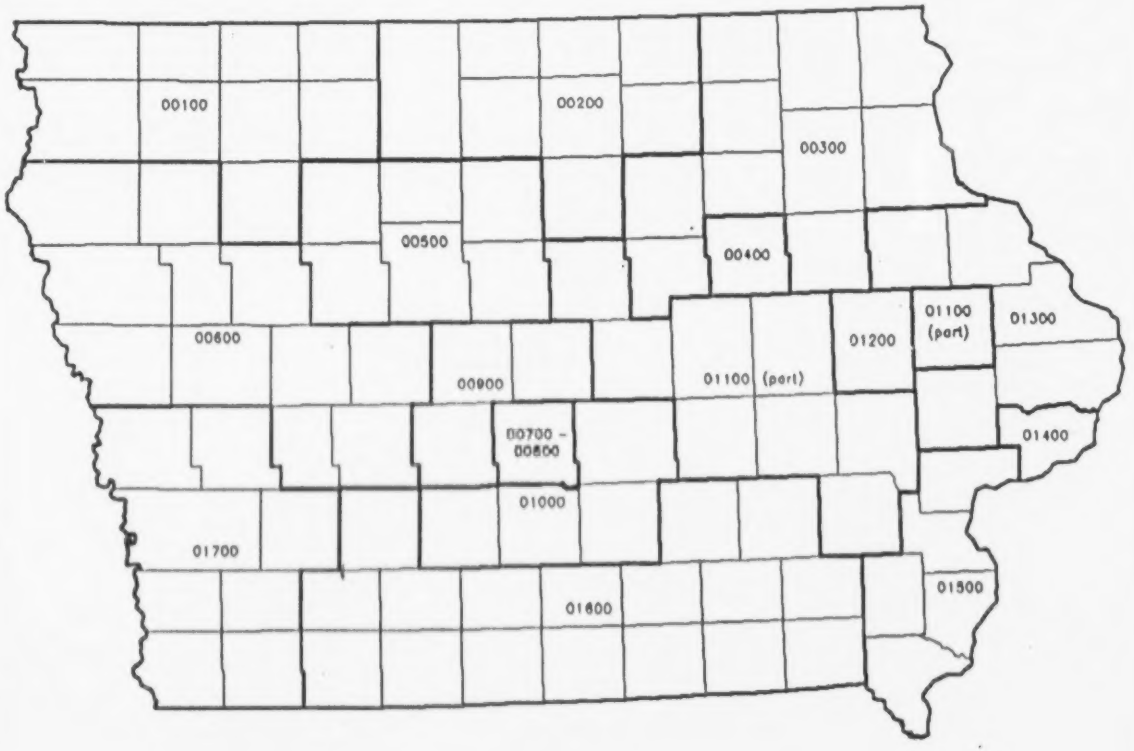
Appendix A

Map of Iowa

PUMA Boundaries

IOWA

5% PUMA BOUNDARIES



IOWA 5% PUMA Boundaries

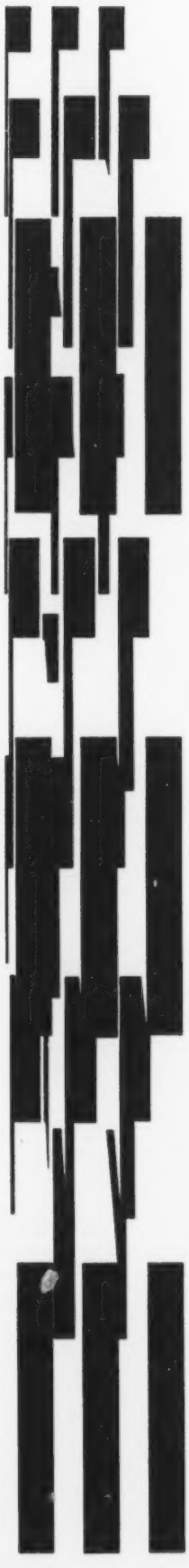
- Counties
- PUMAs
- States

PUMAs In Selected Areas:

00700 Des Moines city
00800 Balance of Polk County

Miles

0 20 40



Appendix B

Listing of Synthetic Literacy Estimates for PUMAs 100-1700

Synthetic Literacy Estimates for PUMA 100

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	11
	Percent in Level 2	20
	Percent in Levels 3-5	68
Prose	Mean Proficiency:	286
	Percent in Level 1	10
	Percent in Level 2	19
	Percent in Levels 3-5	71
Document	Mean Proficiency:	278
	Percent in Level 1	13
	Percent in Level 2	23
	Percent in Levels 3-5	64
Quantitative	Mean Proficiency:	286
	Percent in Level 1	11
	Percent in Level 2	18
	Percent in Levels 3-5	71
Population		100617

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Buena Vista
Clay County
Dickinson
Emmet
Lyon
O'Brien
Osceola
Palo Alto
Sioux

Synthetic Literacy Estimates for PUMA 200

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	285
	Percent in Level 1	10
	Percent in Level 2	23
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	288
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	71
Document	Mean Proficiency:	279
	Percent in Level 1	11
	Percent in Level 2	25
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	287
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	70
Population		102250

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Cerro Gordo
Floyd
Franklin
Hancock
Kossuth
Mitchell
Winnebago
Worth

Synthetic Literacy Estimates for PUMA 300

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	281
	Percent in Level 1	12
	Percent in Level 2	21
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	284
	Percent in Level 1	11
	Percent in Level 2	20
	Percent in Levels 3-5	69
Document	Mean Proficiency:	276
	Percent in Level 1	14
	Percent in Level 2	24
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	283
	Percent in Level 1	12
	Percent in Level 2	20
	Percent in Levels 3-5	68
Population		122491

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Bremer
Allamakee
Buchanan
Butler
Chickasaw
Clayton
Fayette
Grundy
Howard
Winneshiek

Synthetic Literacy Estimates for PUMA 400

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	286
	Percent in Level 1	9
	Percent in Level 2	24
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	23
	Percent in Levels 3-5	70
Document	Mean Proficiency:	281
	Percent in Level 1	10
	Percent in Level 2	26
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	287
	Percent in Level 1	9
	Percent in Level 2	22
	Percent in Levels 3-5	69
Population		90043

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Black Hawk

Synthetic Literacy Estimates for PUMA 500

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	284
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	65
Prose	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	29
	Percent in Levels 3-5	61
Quantitative	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	68
Population		74882

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Calhoun
Hamilton
Humboldt
Pocahontas
Webster
Wright

Synthetic Literacy Estimates for PUMA 600

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	282
	Percent in Level 1	11
	Percent in Level 2	24
	Percent in Levels 3-5	65
Prose	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Document	Mean Proficiency:	277
	Percent in Level 1	12
	Percent in Level 2	27
	Percent in Levels 3-5	61
Quantitative	Mean Proficiency:	284
	Percent in Level 1	10
	Percent in Level 2	22
	Percent in Levels 3-5	67
Population		170777

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Woodbury
Audubon
Carroll
Cherokee
Crawford
Greene
Guthrie
Ida
Monona
Plymouth
Sac

Synthetic Literacy Estimates for PUMA 700

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	26
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	288
	Percent in Level 1	7
	Percent in Level 2	25
	Percent in Levels 3-5	68
Document	Mean Proficiency:	281
	Percent in Level 1	10
	Percent in Level 2	28
	Percent in Levels 3-5	62
Quantitative	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	24
	Percent in Levels 3-5	67
Population		141249

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following city:

Des Moines

Synthetic Literacy Estimates for PUMA 800

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	303
	Percent in Level 1	3
	Percent in Level 2	13
	Percent in Levels 3-5	84
Prose	Mean Proficiency:	306
	Percent in Level 1	3
	Percent in Level 2	12
	Percent in Levels 3-5	86
Document	Mean Proficiency:	299
	Percent in Level 1	4
	Percent in Level 2	15
	Percent in Levels 3-5	81
Quantitative	Mean Proficiency:	306
	Percent in Level 1	3
	Percent in Level 2	11
	Percent in Levels 3-5	86
Population		99427

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following cities and county:

Alleman
Altoona
Ankeny
Bondurant
Carlisle
Clive
Elkhart
Grimes
Johnston
Mitchellville
Pleasant Hill
Polk City
Polk County (part)
Runnells
Saylorville CDP
Sheldahl
Urbandale
West Des Moines
Windsor Heights

Synthetic Literacy Estimates for PUMA 900

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	297
	Percent in Level 1	4
	Percent in Level 2	18
	Percent in Levels 3-5	78
Prose	Mean Proficiency:	300
	Percent in Level 1	4
	Percent in Level 2	16
	Percent in Levels 3-5	80
Document	Mean Proficiency:	293
	Percent in Level 1	6
	Percent in Level 2	20
	Percent in Levels 3-5	75
Quantitative	Mean Proficiency:	300
	Percent in Level 1	4
	Percent in Level 2	16
	Percent in Levels 3-5	80
Population		90448

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Dallas
Boone
Story

Synthetic Literacy Estimates for PUMA 1000

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	71
Prose	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	20
	Percent in Levels 3-5	73
Document	Mean Proficiency:	282
	Percent in Level 1	10
	Percent in Level 2	23
	Percent in Levels 3-5	67
Quantitative	Mean Proficiency:	289
	Percent in Level 1	8
	Percent in Level 2	19
	Percent in Levels 3-5	73
Population		80277

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Warren
Jasper
Madison
Marion

Synthetic Literacy Estimates for PUMA 1100

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	293
	Percent in Level 1	7
	Percent in Level 2	19
	Percent in Levels 3-5	74
Prose	Mean Proficiency:	295
	Percent in Level 1	6
	Percent in Level 2	18
	Percent in Levels 3-5	76
Document	Mean Proficiency:	288
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	70
Quantitative	Mean Proficiency:	295
	Percent in Level 1	7
	Percent in Level 2	17
	Percent in Levels 3-5	76
Population		193000

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Johnson
Benton
Hardin
Iowa
Jones
Marshall
Poweshiek
Tama
Washington

Synthetic Literacy Estimates for PUMA 1200

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	294
	Percent in Level 1	5
	Percent in Level 2	19
	Percent in Levels 3-5	76
Prose	Mean Proficiency:	296
	Percent in Level 1	4
	Percent in Level 2	18
	Percent in Levels 3-5	78
Document	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	21
	Percent in Levels 3-5	73
Quantitative	Mean Proficiency:	296
	Percent in Level 1	5
	Percent in Level 2	18
	Percent in Levels 3-5	77
Population		127040

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Linn

Synthetic Literacy Estimates for PUMA 1300

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	70
Prose	Mean Proficiency:	288
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	71
Document	Mean Proficiency:	281
	Percent in Level 1	11
	Percent in Level 2	23
	Percent in Levels 3-5	66
Quantitative	Mean Proficiency:	288
	Percent in Level 1	9
	Percent in Level 2	20
	Percent in Levels 3-5	71
Population		136511

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Dubuque
Cedar
Clinton
Delaware
Jackson

27

Synthetic Literacy Estimates for PUMA 1400

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	290
	Percent in Level 1	8
	Percent in Level 2	22
	Percent in Levels 3-5	71
Prose	Mean Proficiency:	293
	Percent in Level 1	6
	Percent in Level 2	21
	Percent in Levels 3-5	73
Document	Mean Proficiency:	286
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Quantitative	Mean Proficiency:	292
	Percent in Level 1	8
	Percent in Level 2	20
	Percent in Levels 3-5	72
Population		110745

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Scott

Synthetic Literacy Estimates for PUMA 1500

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	10
	Percent in Level 2	24
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	26
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	285
	Percent in Level 1	10
	Percent in Level 2	22
	Percent in Levels 3-5	68
Population		112281

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Des Moines
Henry
Lee
Louisa
Muscatine

Synthetic Literacy Estimates for PUMA 1600

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	280
	Percent in Level 1	10
	Percent in Level 2	28
	Percent in Levels 3-5	62
Prose	Mean Proficiency:	283
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	65
Document	Mean Proficiency:	275
	Percent in Level 1	12
	Percent in Level 2	29
	Percent in Levels 3-5	58
Quantitative	Mean Proficiency:	283
	Percent in Level 1	10
	Percent in Level 2	26
	Percent in Levels 3-5	65
Population		144096

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Adair
Adams
Appanoose
Clarke
Davis
Decatur
Jefferson
Keokuk
Lucas
Mahaska
Monroe
Ringgold
Taylor
Union
Van Buren
Wapello
Wayne

Synthetic Literacy Estimates for PUMA 1700

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	24
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	28
	Percent in Levels 3-5	62
Quantitative	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Population		128220

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Pottawattamie
Cass
Fremont
Harrison
Mills
Montgomery
Page
Shelby